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Drop Ebooks



# developmental disturbances of teeth

**DR IMAN METWALY**

# Introduction

- ❖ Development of human body begins with a series of cell division , multiplication & differentiation into various structures
- ❖ A **failure** or **disturbance** that occurs during these processes may result in a lack , excess or deformity of a body part
- ❖ These are called developmental disorder , developmental anomalies , abnormalities or disturbances

# Developmental disturbances of teeth

- ❖ Abnormalities of morphodifferentiation :  
abnormalities in the differentiation of dental lamina & tooth germs causes abnormalities in the number , size ,and form of teeth
- ❖ Abnormalities of histodifferentiation :  
abnormalities in the formation of the dental hard structure resulting in disturbances in tooth structure

# Developmental disturbance of teeth

❖ Disturbance may be :

Hereditary { genetics }

Acquired { environmental }

# 1-Disturbances in number of teeth

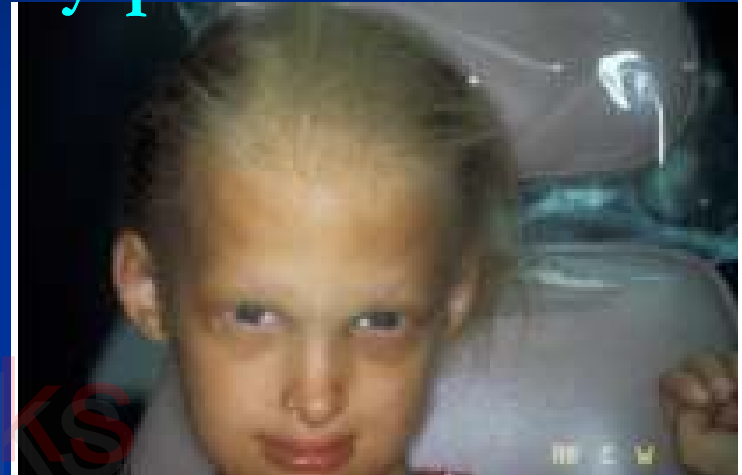
1. **Total anodontia** :total failure of development of a complete dentition {extremely **rare**}
2. **Partial anodontia {hypodontia}** :failure of development of one or more teeth {relatively **common** and often hereditary} the teeth most frequently missing are third molars , permanent maxillary lateral incisors , & 2<sup>nd</sup> premolars
3. **Hypodontia or anodontia** associated with systemic defects
  - 1) Hereditary hypohidrotic ectodermal dysplasia
  - 2) Down syndrome :missing third molars

# 1-Disturbances in number of teeth

## Hereditary hypohidrotic ectodermal dysplasia

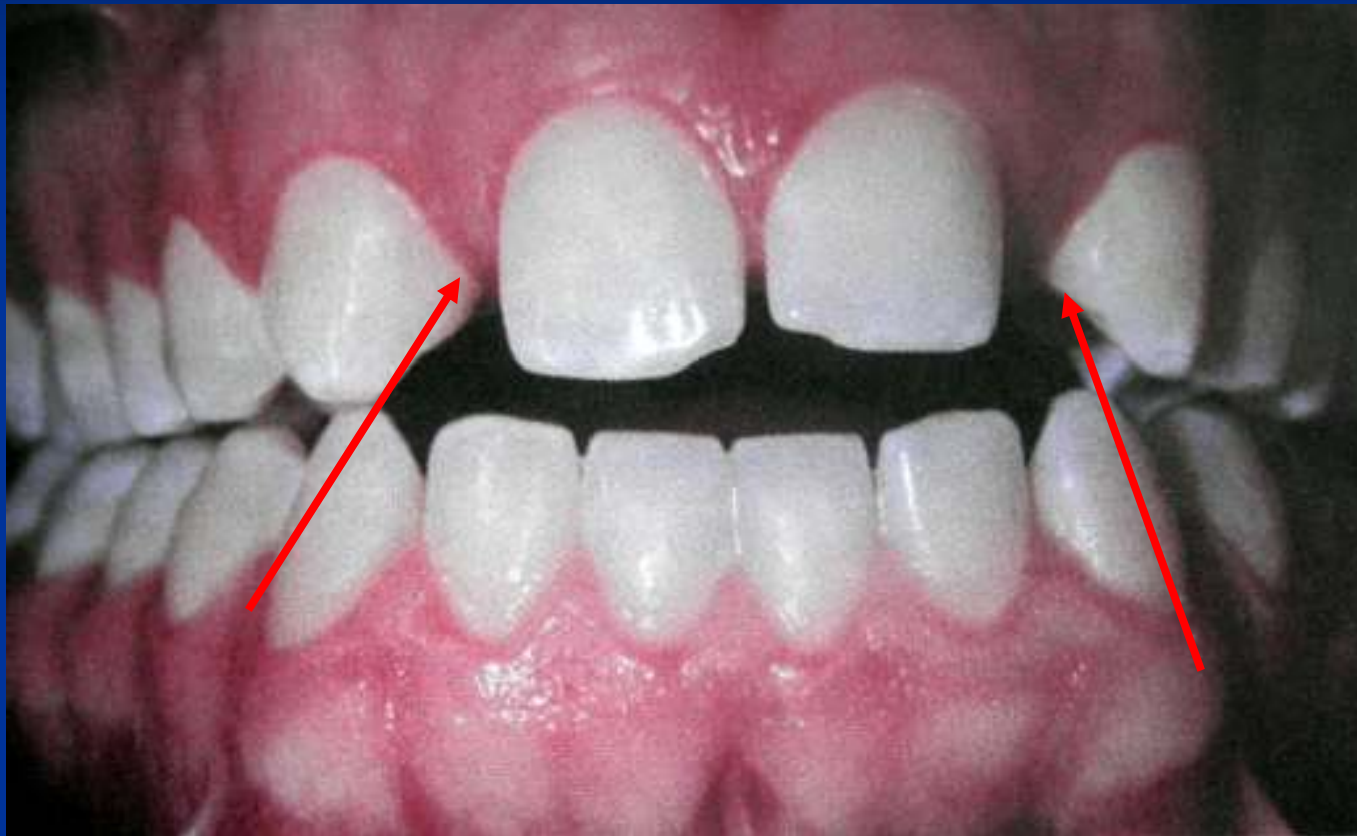
- ❖ Characterized by congenital loss of *ectodermal structures*
- Hypodontia
- Inability to sweat due to absence of sweat glands {anhidrosis}
- Smooth, shiny and dry skin
- Scanty hair {hypotrichosis}
- Defective finger nails

Sex linked recessive trait





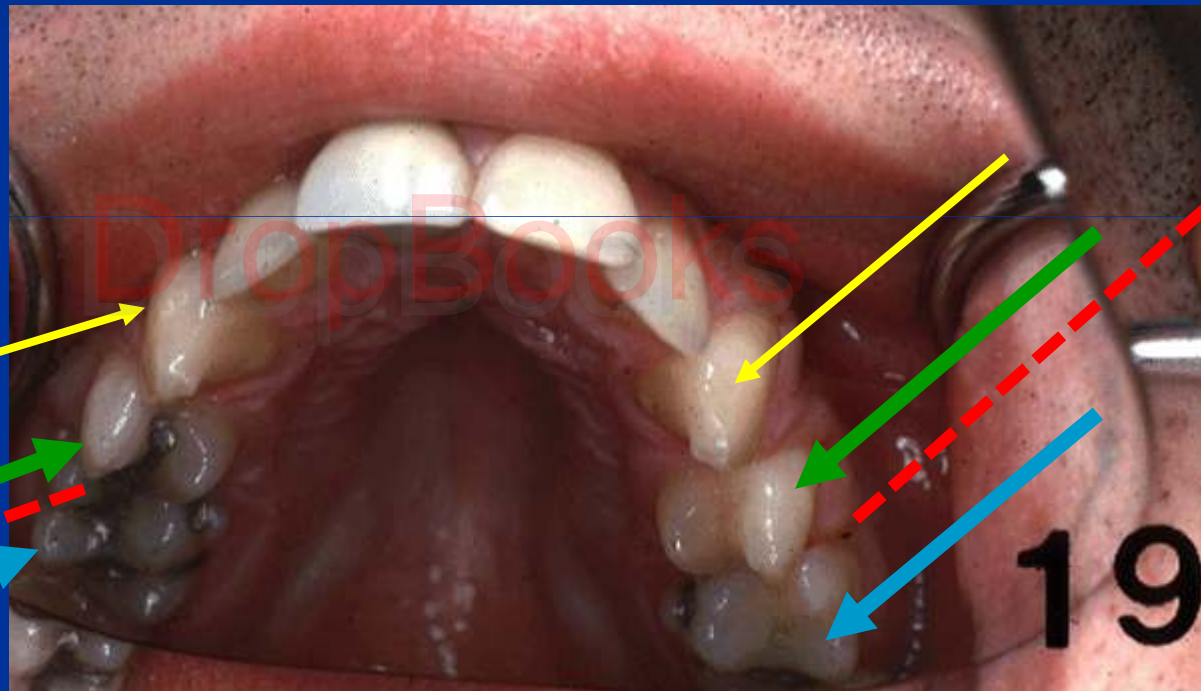
# Disturbances in number of teeth



- ✓ Missing maxillary lateral incisors



- Partial anodontia , missing bilateral maxillary second premolar



# Disturbances in number of teeth

Congenitally missing bicuspid



Anodontia of a permanent 2<sup>nd</sup> premolar with ankylosis of an erupted deciduous molar

# 1-Disturbances in number of teeth

## Hyperdontia

- Additional teeth {relatively common}
  - These are the result of excessive growth of the dental lamina {unknown cause}
  - ❖ **Supplemental teeth** : extra teeth that morphologically resemble normal teeth {maxillary lateral incisor, premolars & 4<sup>th</sup> molar}
  - ❖ **Supernumerary teeth** : extra teeth that morphologically differ from normal teeth {conical or peg shaped}
- Several terms have been used to describe supernumerary teeth depending on their location

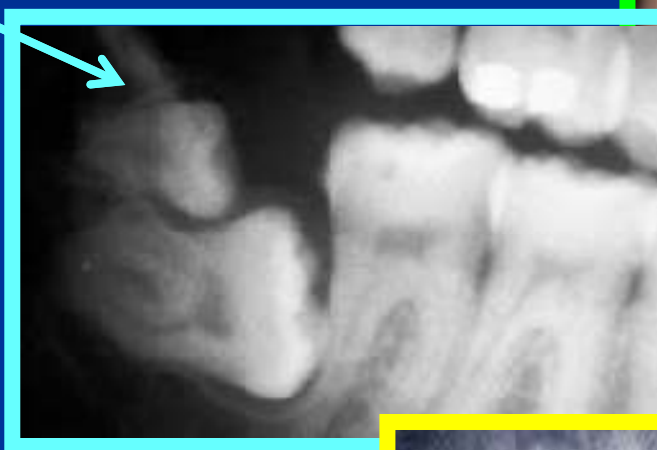


# Disturbances in number of teeth

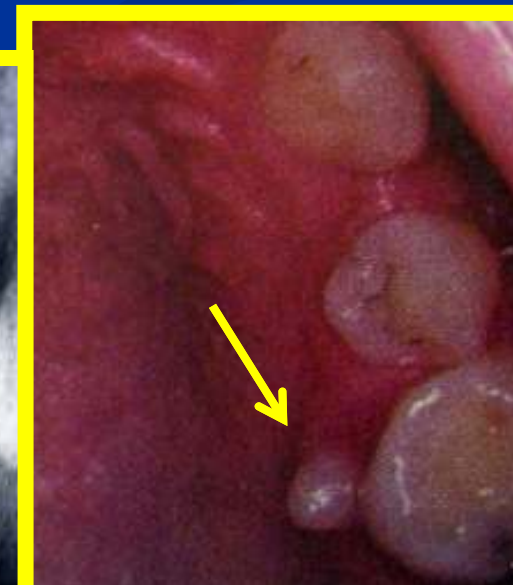
Mesiodens : a supernumerary tooth in the **midline** between the maxillary central incisors



Distomolars  
an accessory **fourth molar**



Paramolar :  
a posterior tooth situated **lingually** or **buccally** to a molar



# Disturbances in number of teeth

## Mesiodens

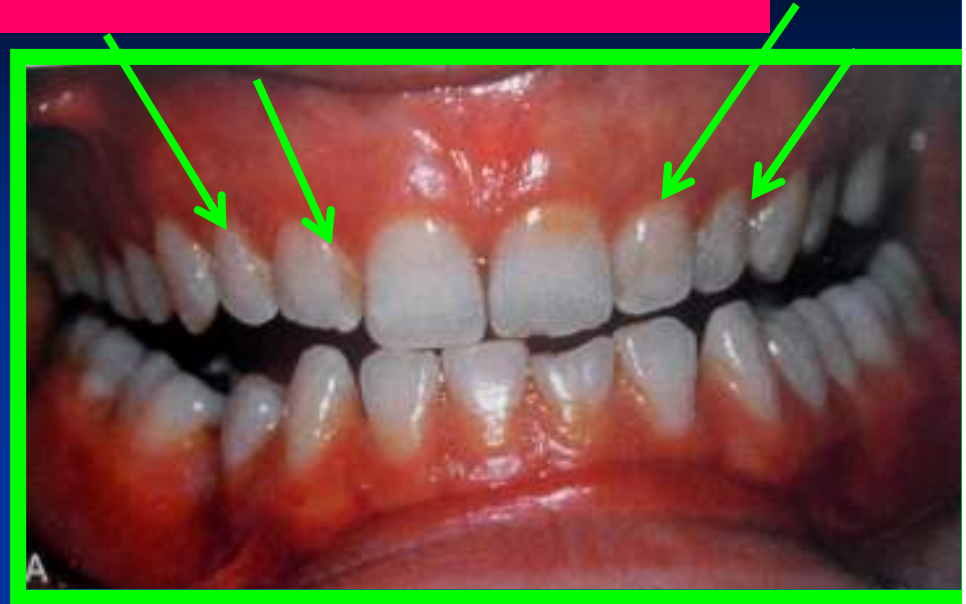




# Disturbances in number of teeth

✓ Supplemental

➤ lateral incisors



➤ Right mandibular dentition exhibiting 4 erupted bicuspid





# 1-Disturbances in number of teeth

- **Natal teeth** : accessory teeth that may be present **at birth**
- **Neonatal teeth** : are those arising **within 30** days of life



# Disturbances in number of teeth

- ❖ Supernumerary teeth may **prevent the eruption** or cause **malposition** or **resorption** of adjacent teeth , and may develop **dentigerous cysts**

## 2-Developmental alteration in the size

- Tooth size is variable among different races and between sexes
- ❖ Macrodonia: teeth larger than average {i.e. physically larger than normal }
- ❖ Microdonia : unusual small teeth { i.e. physically smaller than usual }

# Developmental alteration in the size

- Generalized Macrodontia has been noted in association

1. Pituitary gigantism

2. Facial hemihypertrophy

- Generalized Microdontia has been noted in association with :

1. Pituitary dwarfism

2. Down syndrome

# Developmental alteration in the size

- ❖ Macrodontia affecting single tooth is uncommon
- ❖ Microdontia involving a single tooth is more common than generalized microdontia
  - Most **commonly affected** teeth
    1. Maxillary lateral incisors
    2. Third molars

NB. Both maxillary lateral incisors and third molars are among the most common teeth to be congenitally missing

# Developmental alteration in the size

- The maxillary lateral incisor appear as : Peg shaped crowns overlying a normal root length .  
The mesiodistal diameter is reduced the proximal surfaces converge towards the incisal edge



- The maxillary molar appears small but normally shaped





- ❖ Maxillary lateral
- ❖ 2<sup>nd</sup> premolar
- ❖ 3<sup>rd</sup> molar

- Maxillary lateral
- Premolar
- 4<sup>th</sup> molar

- Maxillary lateral
- 3<sup>rd</sup> molar

- Mesiodens
- Paramolar
- distomolar

## ❖ Hypodontia

## ■ Supplemental

## ➤ Microdontia

## ○ supernumerary

### 3-Developmental alterations in the shape of teeth

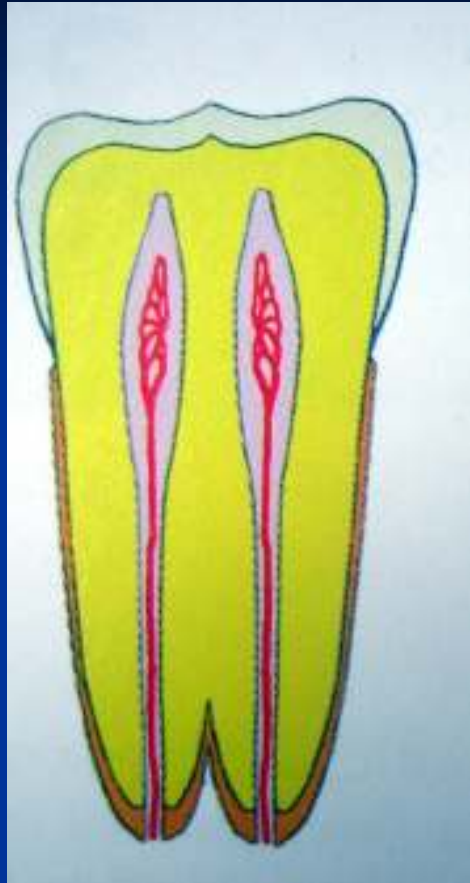
- Fusion , gemination , concrecence:  
terms used for teeth joined together  
based on the suspected aetiology

# Developmental alterations in the shape of teeth

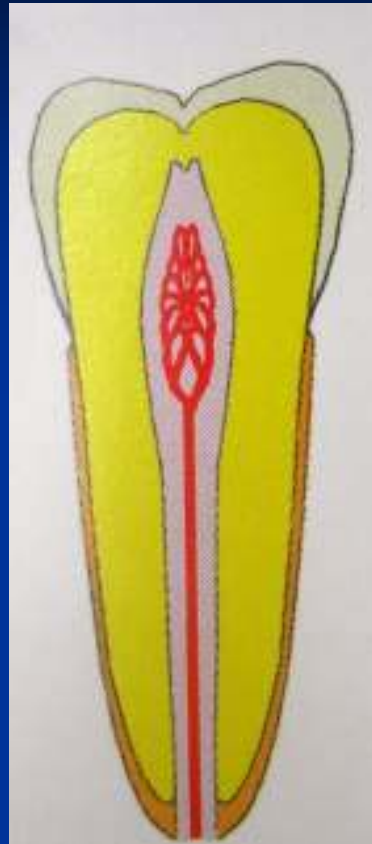
- **Fusion** :union between the dentine & or the enamel of two separate developing teeth
- **Gemination** : partial development of two teeth from a single tooth bud following incomplete division
- **Concrescence** :it is the union of two teeth by cementum it is not a developmental anomaly it occurs after root development caused by trauma or adjacent tooth malposition & crowding of teeth



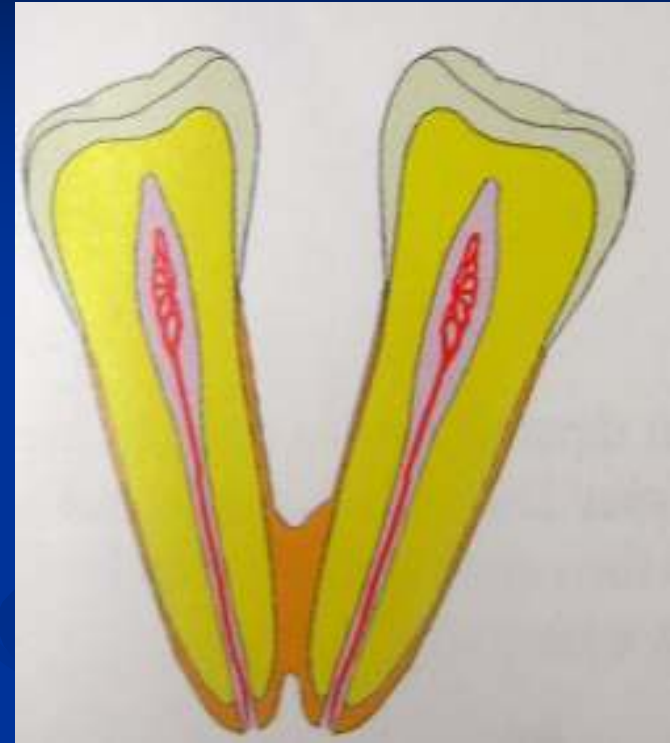
Bifid crown



**Fusion**



**Gemination**



**Concrescence**

# Developmental alterations in the shape of teeth

- Distinction between gemination and fusion is made by counting the number of teeth in the dentition
- **In case of fusion** their number is decreased by one as two teeth are replaced by one single abnormally formed fusion product
- **In case of gemination** , the number is normal but with one of the teeth being replaced by an abnormally formed one

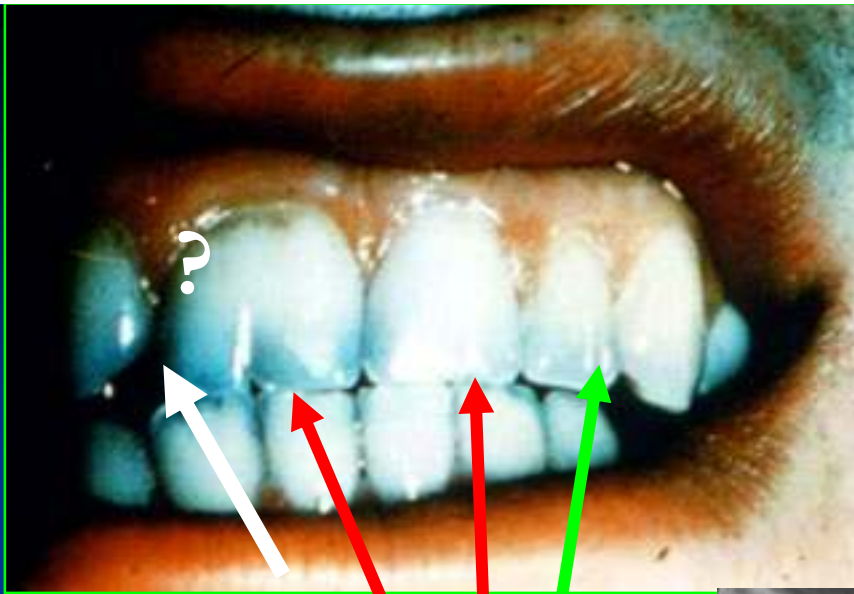
- **Fusion** : bilateral double teeth in the place of the mandibular **lateral incisors** and **cuspid**s



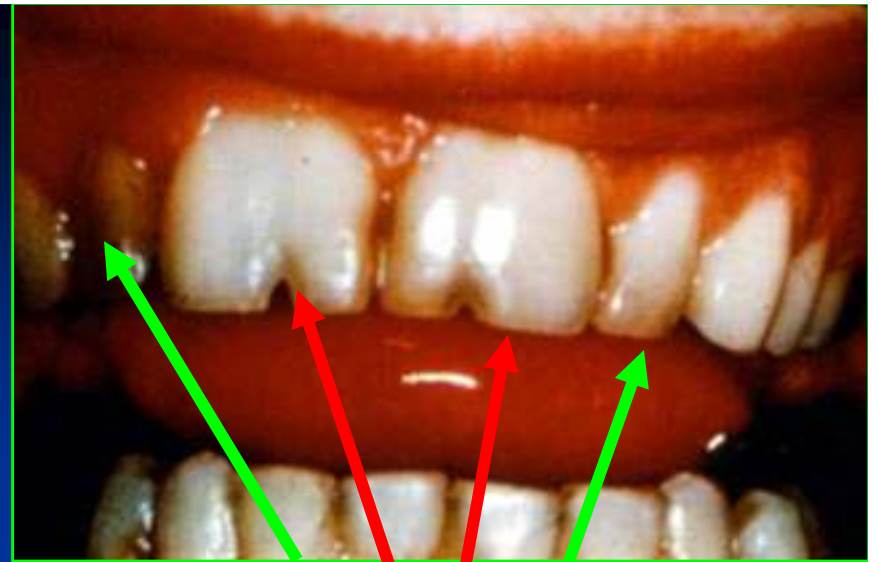


- **Bilateral gemination** : Maxillary central incisors





A



B



# concrecence



## Accessory cusps

Three different pattern are recognized

- Cusp of Carabelli: located on the palatal surface of the mesiolingual cusp of a **maxillary molar**
- Talon cusp: located on the lingual aspect of **anterior teeth** which resembles an eagle talon
- Central tubercle  
an accessory cusp on the occlusal surface between the buccal & lingual cusps of permanent **premolars or molars**

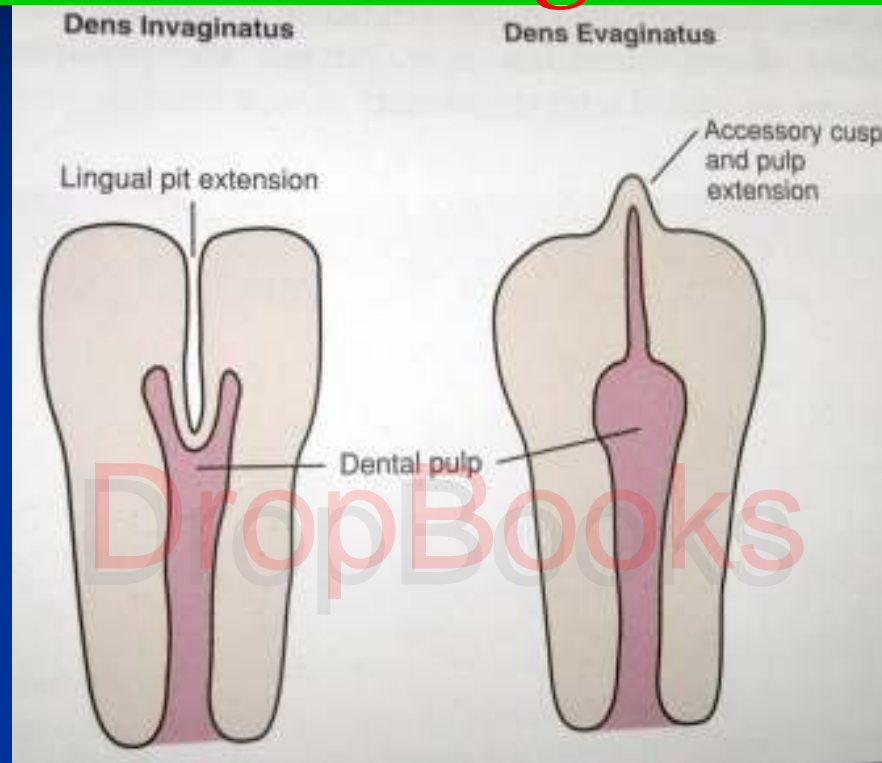




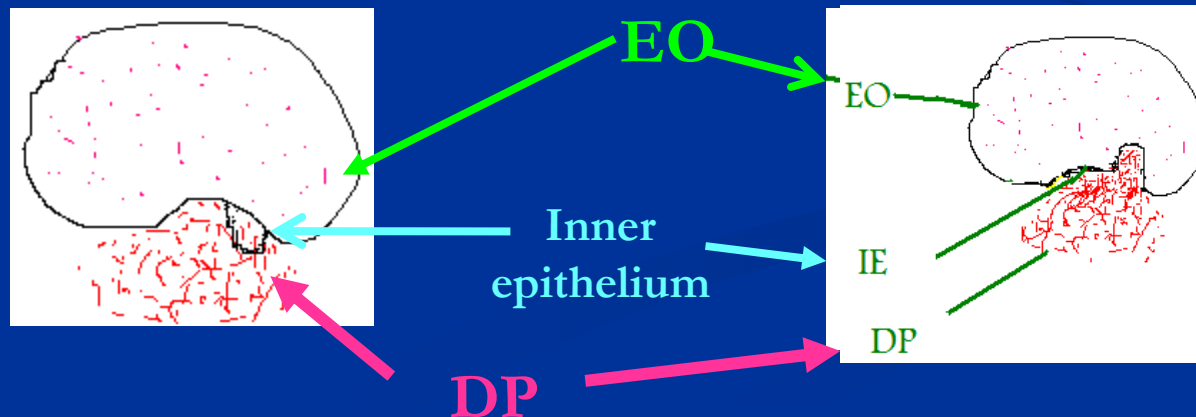
# Dens invaginatus {dens in dente} & Dens evaginatus



Part of the enamel organ invaginate into the papillae producing enamel lined cavity which communicates to the surface



Outward exaggeration of an area of inner enamel epithelium & adjacent odontogenic mesenchyme



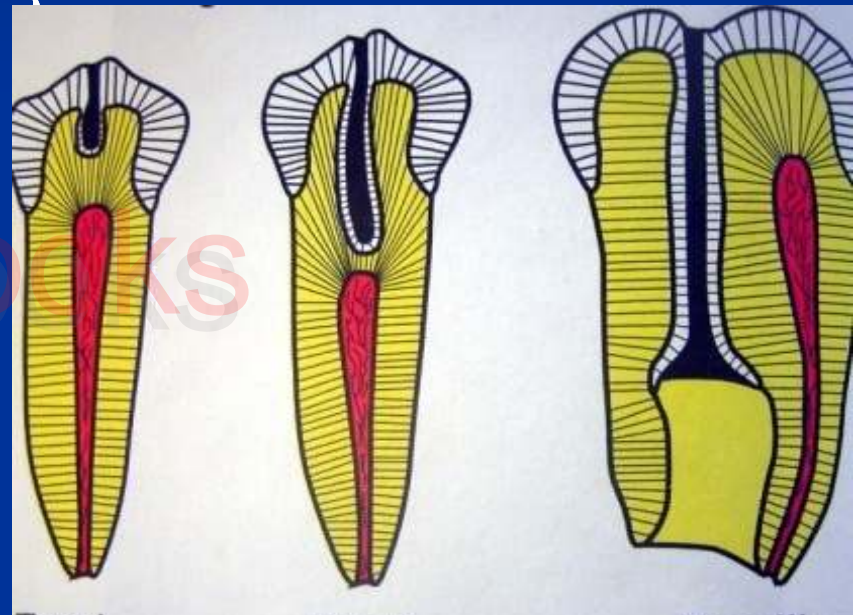
# Dens invaginatus {dens in dente} & Dens evaginatus

- Dens invaginatus {dens in dente}: due to invagination of an area of the inner enamel epithelium into the dental papillae during odontogenesis resulting in the formation of enamel lined cavity which communicates with the surface
- Dens evaginatus : due to proliferation & evagination of an area of inner enamel epithelium & adjacent odontogenic mesenchyme



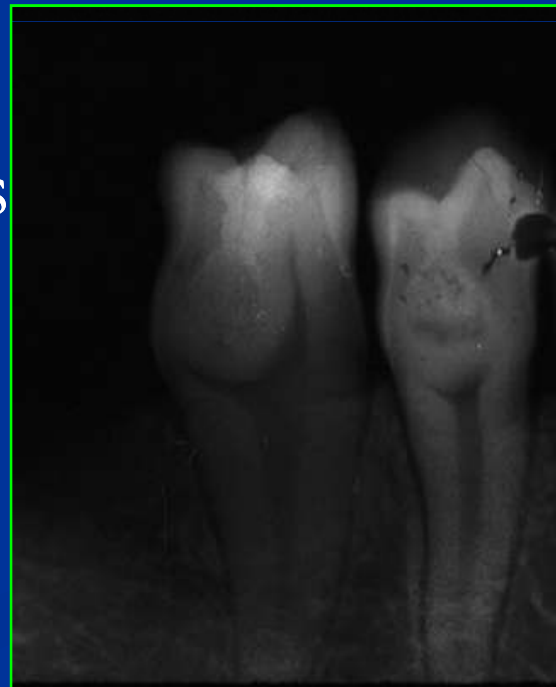
# Dens invaginatus {dens in dente}

- The depth of invagination varies from a **slight** enlargement of the cingulum pit {e.i. exaggeration of the pit} to a **deep** infolding that extends to the apex
- In the interior of the tooth, dilates to form a large cavity
- Through this pit bacteria from the oral cavity have free access to the inner part of the tooth which makes it vulnerable for carious decay



# Dens invaginatus {dens in dente}

- When dentine & enamel forming tissue invaginate the whole length of a tooth {e.i.when invagination is large} it appears radiographically as **a tooth within a tooth** { **dens in dente** }



# Enamel pearl or enameloma {ectopic enamel}

- A small nodule of enamel formed on the root surface near the amelocemental junction , on maxillary molars at the furcation area
- This may result from cells of Hertwig's sheath which have become differentiated into ameloblast
- Occasionally containing minute horn of small pulp



# Taurodontism {bull like tooth}

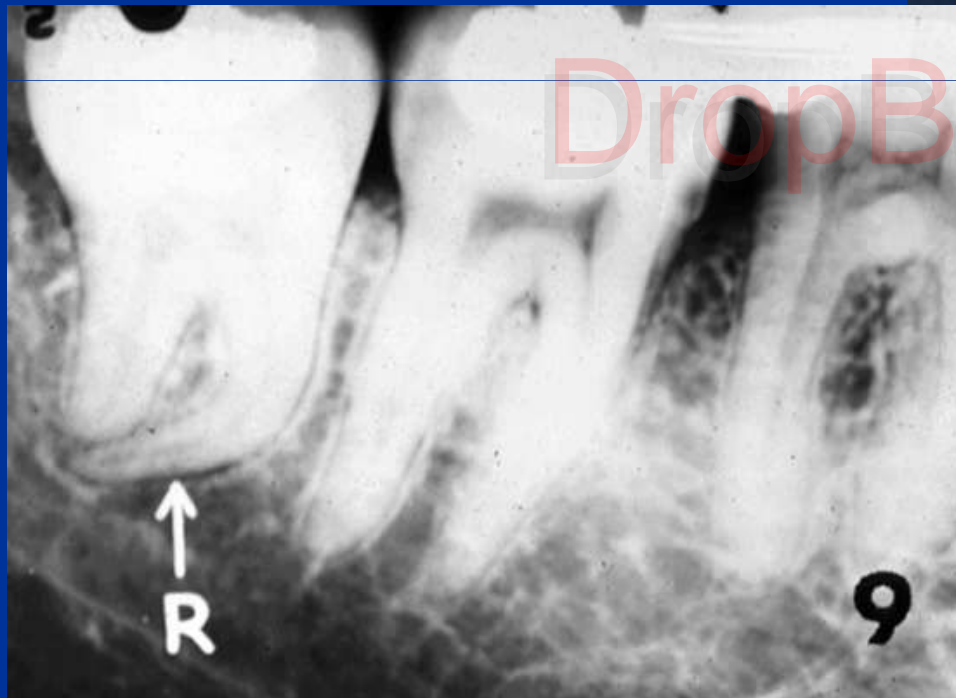


- Elongated crowns & apically displaced furcation {i.e. tends to be rectangular}
- Resulting in pulp chamber that have increased apical-occlusal height
- This condition is due to failure of epithelial root sheath of Hertwig's to invaginate at proper horizontal direction



# Dilaceration

- Abnormal angulation or bend in the root
- The most commonly affected teeth are the maxillary central incisors



# Dilaceration

- The cause :trauma during root development
- **Movement** of the crown or the crown & part of the root {i.e. calcified part } **from** the remaining developing root {i.e. not yet calcified} may result in sharp angulation after the tooth completes development

# Normal enamel is formed in 3 stages

- 1. **Formative stage** : ameloblasts deposit organic matrix → normal thickness of enamel
- 2. **Calcification stage** : mineralization of enamel matrix by *formation of crystals* & *removal* of the majority of the original *proteins*
- 3. **Maturation stage** : crystals enlarges & mature *withdrawal of organic* component



## Formative stage

Normal thickness

Inadequate formation of enamel matrix .Enamel is reduced in quantity but is of normal hardness. {irregular, pitted, thin or vertical grooves}

Hypoplastic enamel

## Calcification stage

1<sup>st</sup> Enamel is opaque {dull, white}& soft

Then Enamel becomes hard & translucent

A defect not in the quantity but in the quality of enamel  
It is poorly mineralized soft & chips & wears easily

Hypocalcified enamel

## Maturation stage

A defect in the crystal structure of enamel leads to a mottled enamel with white to brown to yellow

Hypomaturational enamel



# Amelogenesis imperfecta

- It is a **genetically** determined defect of enamel formation
- **16** different hereditary subtypes exist with numerous **patterns of inheritance** {autosomal dominant, **recessive** or **sex linked**
- **Deciduous** & **permanent** teeth are involved but not to the same extent

# 1-Hypoplastic amelogenesis imperfecta

- ❖ Defective organic matrix formation {quantitative defect}



- Calcification & maturation is normal

- ❖ Thickness of enamel is less than normal

- ❖ Irregular enamel, thin, pitted or vertical grooves

- ❖ Pits allow stains to accumulate causing discoloration

- Normal hardness & translucency

- Radiographically enamel shows normal radiopacity

# Amelogenesis imperfecta {sex linked dominant type}

- Typical **vertical ridged enamel**
- Hypoplastic amelogenesis imperfecta **pitted pattern**



# Hypoplastic amelogenesis imperfecta

- Rough pattern . Small yellow teeth with rough enamel surface , open contact points



## 2-Hypocalcified amelogenesis imperfecta

- Normal quantity of enamel matrix
- Normal thickness & shape in newly erupted teeth only
- ❖ Failure in normal calcification
  - ❖ Enamel soft to probe abrades easily *exposing the dentine* to wear down rapidly to level of gum line {shoulder form}
  - ❖ The color varies from white opaque to yellow to brown
  - ❖ Enamel has similar density to dentin on radiograph





# Hypomaturational amelogenesis imperfecta

- **Normal** enamel matrix which *begins* to mineralize
- ❖ The defect is in the maturational of the enamel's crystal structure
- Teeth are **normal** in shape & thickness
- ❖ Mottled, opaque, white-brown yellow discoloration
- ❖ Enamel is softer than normal, can be pierced by probe under pressure & attrition occurs but not as severely as in the hypocalcified type
- ❖ Radiodensity **similar** to dentin



# Environmental factors affecting developing teeth

## I. Local factors    a. Trauma    b. Infection {abscess}

- ❖ Commonly seen in *permanent* teeth in which the overlying **deciduous** tooth becomes abscessed or physically forced into the enamel organ of the permanent tooth
- Ameloblasts overlying the developing crown are affected resulting in enamel hypocalcification or hypoplasia
- Affected tooth may have areas of coronal **discoloration** or **pits & irregularities** {turner'tooth}

# environmental factors affecting developing teeth

## II. Systemic factors

1. Congenital syphilis
2. Ingestion of chemicals {fluorides ,  
tetracycline}
3. Nutritional deficiency {Vit .A , D , calcium,  
phosphorus}
4. Exanthematous fevers {Scarlet fever ,  
measles, chicken pox}
5. General diseases ex. Rickets , Down  
syndrome Cleidocranial dysplasia



# Acquired {environmental} alterations in the structure of enamel

To differentiate between developmental & acquired alterations that may affect the tooth you must notice the following :

## Hereditary

- Affect **both** deciduous & permanent
- Affect either the enamel or the dentine
- Produce diffuse or vertically oriented defects

## Environmental

- Affect only one dentition {permanent>deciduous}
- Affects **both** enamel & dentine
- Produce horizontal oriented defects



✓ Enamel hypoplasia  
following a *pattern suggestive* of  
systemic problem such as  
high fever

# Fluorosis {mottled enamel}

- Seen in people who grow up in areas where the water supply contains a large amount of fluorides **more than 1ppm**
- **Overdose** of fluorides interferes with the function **of ameloblasts** & **calcification** of the enamel matrix
- **Defect range** from small white spots to white opaque areas to darkly stained & pitted enamel

# Fluorosis {mottled enamel}



The extent of damage is dependent on the duration  
timing & concentration of fluoride

# Congenital syphilis

- Prenatal syphilis is due to maternal infection
  - If the fetus is infected, early abortion occurs
  - Later fetal infection results in infant born with stigmata or congenital syphilis
- ❖ The permanent teeth are affected
- ❖ Because spirochetes do not enter the circulation until the 16<sup>th</sup> week of intrauterine life {deciduous teeth has completely formed by the end of the 16<sup>th</sup> week}

# Congenital syphilis

- A . Mulberry molar: the 1<sup>st</sup> molar may be dome shaped {moon molar} . Its occlusal surface exhibit multiple **irregular tubercles** replacing normal cusps



- B . Hutchinson's teeth {upper incisors}

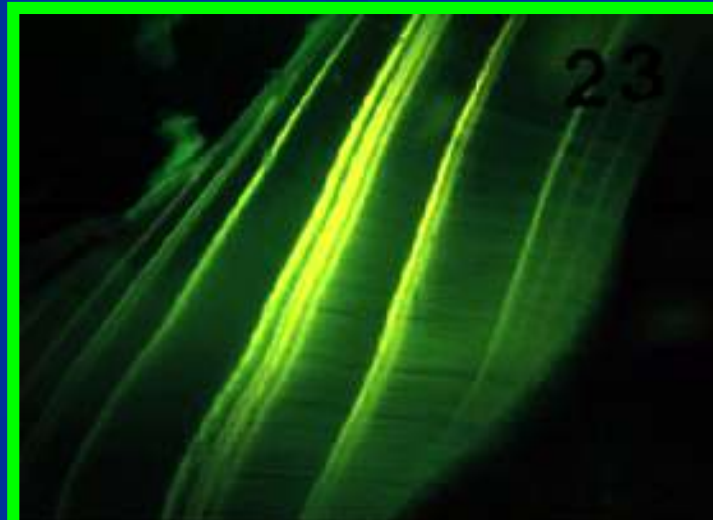
- Barrel shaped teeth
- Mesio & distal convergence in incisal half of teeth
- Mesial & distal angles are rounded
- Notch in the middle of incisor edge





# Tetracycline pigmentation

1. Tetracycline binds to the calcifying tissue → stains the developing teeth & bone
2. Tetracycline is deposited along the incremental lines of dentine & enamel whole tooth may be discolored {bright yellow → dirty greyish brown}
3. Affected teeth exhibit fluorescence under ultraviolet rays





# Developmental alterations in the dentine of the tooth

1. Dentinogenesis imperfecta
2. Dentinal dysplasia {rootless teeth}
3. Regional odontodysplasia {ghost cells}
4. Shell teeth

# Dentinogenesis imperfecta

- Uncommon defect of collagen formation transmitted as an autosomal dominant trait
- Both dentition are affected
- Dentin is soft and has an abnormal high water content
- Appears alone or associated with osteogenesis imperfecta

# Dentinogenesis imperfecta

1. Tooth crown shows amber coloration  
{ blue brown }  
or opalescent  
{ abnormally translucent }



2. Bulbous crown &  
short roots



# Dentinogenesis imperfecta

## 3. Absence of scalloping

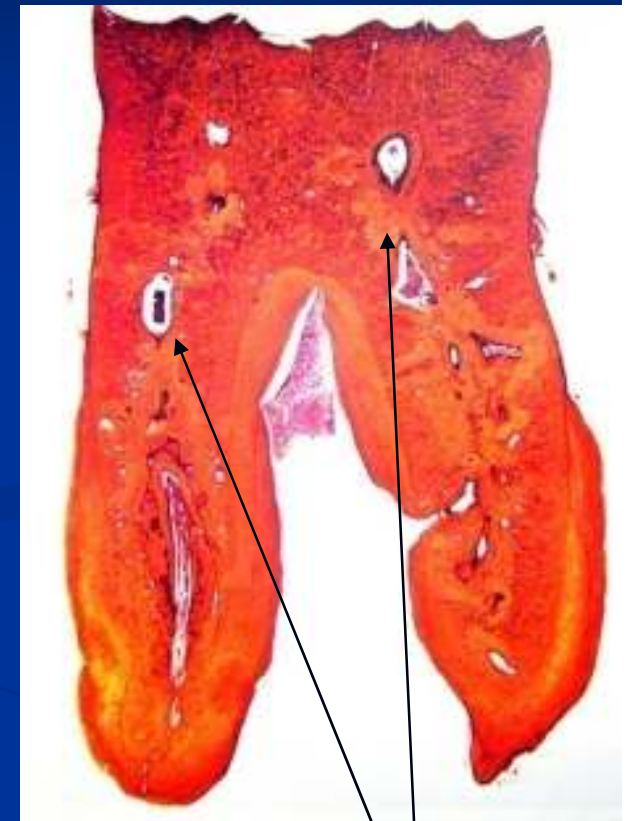
- Absence of scalloping between enamel and dentine → flat ADJ → union between enamel and dentine is defective → enamel chips away → soft dentine will be exposed → rapidly wear off → worn down to gum level by adolescence

Some enamel remains around the necks of the posterior teeth



# Dentinogenesis imperfecta

4. Pulp chamber is obliterated by continuous formation of the imperfect dentine



Remnants of pulp  
chamber  
Picrothionin stain

# Dentine dysplasia {rootless teeth}

1. Characterized by teeth with very short roots
  2. Obliteration of the pulp chamber by fused rounded nodules of poorly formed dentine
- The teeth are typically lost early in life because of the weak support given by the short roots or periapical inflammatory lesions





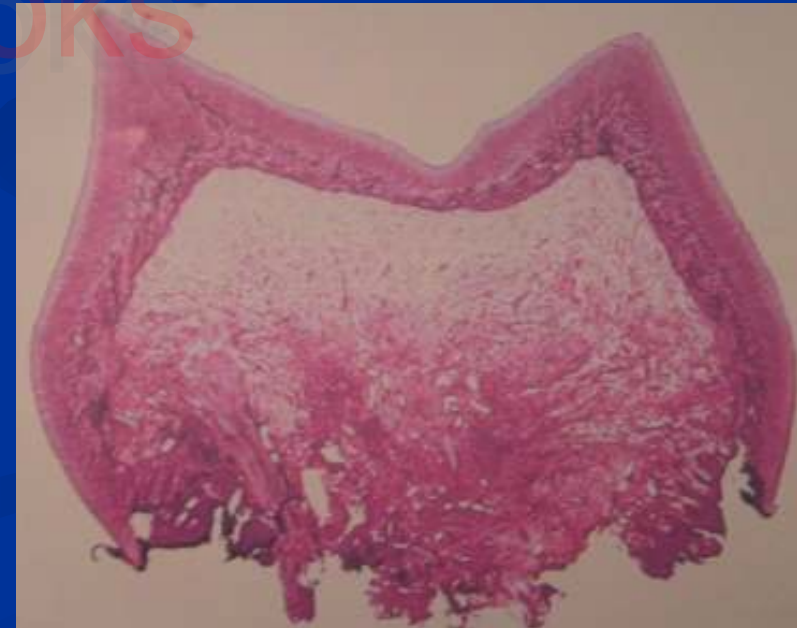
# Regional odontodysplasia {ghost teeth}

- Unknown cause
- Involves **deficiencies** of all tissues of the teeth {enamel dentine & cementum}
- Tissues are thin, poorly mineralized & are described as ghost teeth radiographically
- The poor quality of the affected teeth make them of little use



# Shell teeth

- Excessively large pulp chamber
- After the formation of a thin layer of dentine the formation of dentine ceases & results in a very large pulp chamber surrounded by a thin shell of dentine
- **Enamel is normal**
  - Variant of dentinogenesis imperfecta
  - Transmitted through the same gene



# Shell teeth

- Normal thickness of enamel ,extremely thin dentine& dramatically enlarged pulp



Normal pulp



***Thank You***